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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/892,023	06/26/2001	Kiyohiko Takagi	F-7041	1827

7590 08/01/2002  
Jordan and Hamburg  
122 East 42nd Street  
New York, NY 10168

EXAMINER

COLEMAN, WILLIAM D

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 08/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/892,023

Applicant(s)

TAKAGI ET AL.

Examiner

W. David Coleman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 July 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 3, 14 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Hori et al., U.S. Patent 5,445,710.

3. Pertaining to claim 1, see **FIGS. 1-29** where Hori teaches a dry etching process including:

introducing a processing gas into a vacuum chamber to achieve a predetermined controlled pressure level therein; applying radio frequency power **24** (see **FIG. 2**) to a substrate **21** placed within the vacuum chamber **20a** for generating plasma (not shown) in the vacuum chamber, whereby the substrate is processed, the substrate having a plurality of stacked layers including metal layers (see **FIG. 9A-9F**); etching the layers on the substrate with the processing gas until a time point when the surface of a lowermost layer on the substrate is etched; and adding CHF (column 13, line 42), gas to the processing gas for etching the lowermost layer on the substrate.

4. Pertaining to claim 2, Hori teaches the dry etching process according to Claim 1, wherein the etching process is effected through a method of determining a layer being processed.
5. Pertaining to claim 3, Hori teaches the dry etching process according to Claim 1,

wherein the lowermost layer on the substrate is the subject to be etched (see **FIGS. 1A-1D**).

6. Pertaining to claim 12, Hori teaches the dry etching process according to one of the Claims, 7-11, wherein the lowermost layer on the substrate includes titanium (column 6, lines 55-60).
7. Pertaining to claim 14, See **FIGS. 3, 5, 6, 8, 13, 17 and 22** where Hori teaches the dry etching process according to Claim 2, wherein the method of determining is based upon the sampling data obtained from experimentation.
8. Pertaining to claim 15, Hori teaches the dry etching process according to claim 15, wherein a non-aluminum reactive gas is added when the substrate includes a layer of aluminum.

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hori et al., U.S. Patent 5,445,710 as applied to claims 1, 2, 3, 12, 14 and 15 above, and further in view of Fong et al., U.S. Patent 5,939,831.
11. Pertaining to claim 4, Hori fails to teach the dry etching process according to claim 2, wherein the method of determining is monitoring the etching process by detecting plasma light. Fong teaches an end point detection using the plasma light intensity. In view of Fong, it would

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have been obvious to one of ordinary skill in the art to incorporate the endpoint detection process of Fong into the Hori semiconductor process because conventional endpoint detection systems typically rely on the use of a plasma within the chamber to check emissions from the plasma (column 9, lines 11-13).

12. Pertaining to claim 5, Hori teaches the dry etching process according to claim 4, wherein the processing gas is one of  $\text{Cl}_2$  and a gaseous mixture containing  $\text{Cl}_2$  (column 16, lines 16-18).

13. Pertaining to claim 6, Hori teaches the dry etching process according to claim 5, wherein a non-aluminum reactive gas is added when the substrate includes a layer of aluminum (column 19, lines 34-42).

14. Pertaining to claims 7, 8, 9, 10, 11, 17, 18, 19, 20 and 21, Hori in view of Given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)

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Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979). fail to teaches the proportions of the gas ratios as claimed.

15. Pertaining to claim 22, Hori teaches the dry etching process according to one of the Claims, 17-21, wherein the lowermost layer on the substrate includes titanium (column 6, lines 55-60).
16. Claims 13 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hori et al., U.S. Patent 5,455,710 in view of Fong et al., U.S. Patent 5,939,831 as applied to claims 1-12 and 14-22 above, and further in view of Ishigami U.S. Patent 6,097,094.
17. The combined teachings of Hori and Fong discloses a semiconductor process substantially as claimed as discussed above. However, Hori in view of Fong fail to teach the dry etching process wherein the metal layers of the plurality of stacked layers comprise an aluminum middle layer and titanium top and bottom layers. Ishigami teaches an etching process wherein the metal layers of the plurality of stack layers comprise an aluminum middle layer and titanium top and bottom layers. See **FIG. 4A**, where Ishigami teaches a middle layer **9-1** and titanium top layer **9-3A** and titanium bottom layer **9-1A**. In view of Ishigami, it would have been obvious to one of ordinary skill in the art to incorporate a aluminum middle layer and titanium top and bottom layers in the combined teachings of Hori in view of Fong because the etching forms lower wiring layer **10B-1** (column 6, liens 57-64).

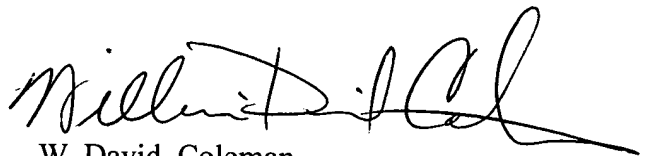
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*Conclusion*

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 703-305-0004. The examiner can normally be reached on 9:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



W. David Coleman  
Examiner  
Art Unit 2823

WDC  
July 29, 2002